Aggregate Fluctuations and Development

Societal Relevance

In accordance with article 23.5 of the "Regulation governing the attainment of doctoral degrees at Maastricht University" decreed by resolution of the Board of Deans, dated 3 July 2013, an addendum must be added about valorization.

Looking Back

The aim of this dissertation was to assemble a number of studies concerned with the analysis of developing-country macroeconomic volatility, both from consumption and output perspectives. This addendum on valorization provides an opportunity to reflect on that encompassing exercise and to draw some general lessons from it, as well as to indicate some directions for the future. We begin with briefly summarising the stories once again.

The areas of application were diverse. On the consumption side, Chapter 2 investigated the welfare cost of business cycles in 36 sub-Saharan African countries, of which 11 are members of the CFA Franc Zone, a seven and plus decades currency union. Two parametric and one nonparametric methods were used to compare the welfare cost of aggregate consumption fluctuations between the CFA member states and the countries outside the union. Depending on the calibration model used, we found that the sample mean cost of business cycles for the group of non-CFA member states is between 11 and 48 percent higher than that of the members of the union. However, a parametric two-sample t-test showed that these results were not sufficiently robust to means difference comparisons.

The next chapter was concerned with the role of structural breaks in aggregate time series, also looking from the consumption side. Specifically, Chapter 3 combines a robust recursive preference framework and a strong structural break algorithm to infer on the welfare costs of consumption fluctuations and the gains from consumption growth. It departs from the previous literature specifically on the ground of structural change, which is likely to arise in any aggregate time series, as acknowledged by the recent macroeconomic literature. The chapter covers 37 Low-Income and the Lower-Middle-Income countries, from sub-Saharan Africa, Asia, Latin America and South-East Asia to some extent, and

considers the 1960-2014 time-span. At first, the results show that for all countries concerned and for a relatively long period of time, the welfare gains from a perpetual one percent increase of lifetime consumption growth transcend the welfare costs of aggregate consumption fluctuations. These results hold firmly when the analysis is repeated before and after structural breaks, given that the number of years covered exceeds 22. Second, and central to the analysis, Chapter 3 shows that the null hypothesis of the equality between the sample averages of the welfare cost of business cycles for the general and the restricted models is not rejected. The overarching implication for this result is that in the context of a recursive preference specification, unique structural breaks do not matter when it comes to the interpretation of the sample average welfare cost of business cycles, especially when such sample exhibits a high degree of homogeneity. However, the two-tail probability of the test equating the sample averages of the welfare gains from growth between the general and the restricted models was significant, suggesting that structural breaks do matter for growth.

On the output side, Chapter 4 examined the relationship between economic structure and the ability of countries to sustain stable economic growth, using both a linear panel and a threshold panel models. The structural variables included the degree of specialisation in the structure of value added as measured by the Theil index, the share of manufacturing in value added, the share of the modern sector in value added and the share of manufacturing within the modern sector. These variables were all measured both in terms of initial levels at the start of the period, or in terms of their changes over that period, and the main dependent variable was the volatility of growth rates in consecutive five-year periods. In the linear model, the results show that, first, a higher manufacturing share may help reduce the volatility of economic growth. Second, if we look at the share of manufacturing value added within the modern sector of the economy rather than its share in the GDP, a very similar picture emerges. Third, the impact of the modern sector's share on the ability to sustain growth was more ambiguous than that of manufacturing, hence making it more difficult to interpret. Finally, the results for specialisation unexpectedly showed no significant effect on volatility.

In the threshold model of Chapter 4, we used twelve different specifications grouped in three main categories, mainly according to the choice of our regime-dependent variable. Estimating thresholds based directly on the level of economic structure did not always yield a significant result. For instance, the share of manufacturing in modern sector did not add any meaningful layer to the analysis when this indicator was chosen both as regime-dependent and threshold variable. Finally, we alternated various independent variables – the share of exports in GDP, the per capita GDP in 1960 and the natural logarithm of population in 1960 – as alternative threshold variables. The share of exports in GDP did not act as a significant threshold in none of our specifications. The original income level of 1960 however mattered in two cases, when the share of manufacturing in value added and the share of manufacturing in the modern sector were our preferred

regime-dependent variables, respectively. We also found that the population somehow mattered when it comes to the volatility-reducing effects of economic structure.

A final chapter (Chapter 5) of this second part of the dissertation explored, in what was a mostly theoretical argumentation, about the effects of random violent shocks – also referred to as rare disasters – both on economic growth and the steady-state speed of convergence. We showed that rare disasters impact the economic growth through its adverse effects on the equilibrium real interest rate, which is also the price of physical capital when markets are clear and when there is no externality. This result was extended to alternative production function specifications, notably to the AK model and to a *learning-by-doing* technology. Furthermore, we showed that a rare disaster affects the balanced growth path's speed of convergence through the elasticity of output with respect to the intensive-form physical capital. The direction and amplitude of this impact depend fundamentally on how the new value of this elasticity compares to the share of physical capital in total output when there is no shock.

Looking Ahead

Just like any other branch of social science, economic research is also made out of little steps, sometimes up and sometimes down, on the irregular road of progress and discoveries. The real world is far too complex for our modest analyses of it to pretend ever to be complete, definitive or exhaustive. Every issue being "resolved" opens the way for more unanswered questions. Hence it is not surprising that the complications which showed down in the preceding chapters also made room and created perspectives for further work. Based on that, the immediate follow-up is to venture in some ideas for future research.

On the Optimum Currency Area (OCA) debate and the role of structural breaks, an interesting guideline for further work is not only to allow for more general heterogeneity between countries and for the possibility of multiple breaks, but also and ultimately to account for more features found in aggregate consumption data, especially when the compensatory factor to fluctuations is concerned. Concretely, what role could economic and exports sophistication play in taming the welfare effects of aggregate fluctuations? Are currency unions with pegged exchange rates such as the CFA Franc potentially vulnerable to the fluctuations of the Euro? How much the development of robust domestic debt markets could contribute to reducing the exposure of developing countries to the interest rates volatility? Are domestic macroeconomic fiscal and monetary stabilisation policies key in reducing aggregate consumption volatility? Can a developing country's integration in the international capital markets help significantly contain consumption volatility? And what could be the implications of allowing for multiple structural breaks in the sequential procedure for testing and dating interruptions in the consumption series, both for the welfare costs of fluctuations as well as the welfare gains of consumption stabilisation? Each one of these questions deserves on its own a detailed and systematic attention.

On the subject of investigating the role of economic structure on the ability of countries to sustain growth, the main question left unattended was perhaps the integration in the linked estimation framework of recent developments in growth episodes and non-linear patterns. That is because growth is fundamentally uneven in the developing world and could be probably better understood by identifying and analysing sequences of qualitatively different growth episodes, such as accelerations, collapses, stagnation and subsequent recoveries. This could certainly expand our understanding of the many dynamics of growth and the ability of economic structure to sustain it.

On the purely theoretical part of this dissertation – Chapter 5 –, we do need to have a better understanding, beyond a simple back-of-the-envelope calibration, of the exact directions and magnitudes of the effects of rare random shocks on economic growth and the speed of convergence. Perhaps a convenient way to do so could be by using detailed simulations, based on estimates from either structural or VAR models.

Pondering on Policy

Testament of the societal relevance of this research is the fact that most of its policy-oriented findings were presented in the fall of 2017 at Malabo (Equatorial Guinea), during the 5th Congress of African Economists, in front of various policy makers from the African Union, national governments officials and other operatives from the regional blocks of the continent, such as the Economic Organization of West African States (ECOWAS), the Central African Economic and Monetary Union (CAEMC), the West African Monetary Union (WAEMU), and some delegates from the European Union. Also, an earlier and longer version of Chapter 4 was intended as a background paper for the 2016 United Nations Industrial Development Organization (UNIDO)'s *Industrial Development Report* on The Role of Technology and Innovation in Inclusive and Sustainable Industrial Development.

A core target group of this research consists of policy makers in international agencies (African Union, United Nations, International Monetary Fund, World Bank, European Commission, ECOWAS, African Development Bank, etc.). Other target groups of this dissertation are macroeconomic practitioners, central bankers, national governments and statistical offices. The research also targets the wider academic community as well as the readership of journals and blogs (such as the UNU-MERIT blog). The outputs of all four papers were discussed at various conferences and events, as part of the dissemination efforts.

All research in this dissertation is intended to be published in peer-reviewed and internationally acclaimed journals, whenever possible. As a first step in this direction, Chapter 2 and Chapter 3 are separately forthcoming in the *African Integration and Development Review*.